IN THE CLAIMS

1. (original) A spot size converter, comprising:

a semiconductor substrate;

a first waveguide stacked on the semiconductor substrate in a ridge shape and provided for optical coupling with an optical fiber; and

a second waveguide formed on the first waveguide for a spot size conversion, wherein the second waveguide has a taper shape having a width that is gradually widened in a direction along the waveguide at a start portion, and the start portion of the second waveguide has a mesa structure or a reverse-mesa structure.

2. (original) The spot size converter as claimed in claim 1, wherein the mesa structure or the reverse-mesa structure has a width of below 1 μm (middle portion in thickness).

3. (original) The spot size converter as claimed in claim 1, wherein the first waveguide consists of a multi-layer having structure that three InP layers of 600nm in thickness and three InGaAsP (λ g=1.24 μm) layers of 50nm in thickness are stacked alternately and repeatedly.

4. (original) The spot size converter as claimed in claim 1, wherein the second waveguide has an InGaAsP (lg=1.24 μm) layer in the range of 500nm to 600nm in thickness.

5. (withdrawn) A method of manufacturing a spot size converter, wherein the spot size converter includes a semiconductor substrate; a first waveguide stacked on the semiconductor substrate in a ridge shape and provided for optical coupling with an optical fiber; and a second waveguide formed on the first waveguide for a spot size conversion, wherein the second waveguide has a taper shape having a width that is gradually widened in a direction along the waveguide at a start portion, characterized in comprising the steps of:

forming an etch mask on the second waveguide to remain the taper shape ;

performing a dry etch of a given depth for the second waveguide using the etch mask; and

forming the start portion of the second waveguide dry etched, to have a mesa structure or a reverse-mesa structure by using an undercut wet etch process.

6. (withdrawn) The method as claimed in claim 5, wherein the etch mask has a width in the range of 1.5 to 2 μm and is formed by photolithography.

7. (withdrawn) The method as claimed in claim 5, wherein the mesa structure or the reverse-mesa structure has a width of below 1 μm (middle portion in thickness).

8. (withdrawn) The method as claimed in claim 5, wherein the second waveguide has an InGaAsP (lg=1.24 μm) layer in the range of 500nm to 600nm in thickness; the dry etch process etches the second waveguide in thickness in the range of 200nm to 400nm; and the undercut wet etch process is implemented by using a phosphoric acid based etch solution.

9. (withdrawn) The method as claimed in claim 5, wherein the mesa structure or the reverse-mesa structure has a azimuthal angle in the range of 30° to 60°.

10. (original) A spot size converter integrated photodetector, comprising:

a semiconductor substrate;

a first waveguide for optical coupling with an optical fiber that is stacked on the semiconductor substrate and divided into a photodetection region and a spot size converter region, wherein the first waveguide is patterned in the spot size converter region in a ridge shape;

a second waveguide for converting the spot size; wherein the second waveguide has a taper shape having a width that is gradually widened in a direction along the waveguide from a start portion on the first waveguide of the spot size converter, start portion of said second waveguide of the spot size converter has a mesa structure or a reverse-mesa structure, and said second waveguide is extended to the first waveguide of the spot size converter on the photodetection region; and

an absorption layer, a cladding layer and an electrode layer, which are consecutively formed on the second waveguide of the photodetection region.

11. (original)The spot size converter integrated photodetector as claimed in claim 10, wherein the mesa structure or the reverse-mesa structure has a width of below 1 μm (middle portion in thickness).

12. (original) The spot size converter integrated photodetector as claimed in claim 10, wherein the first waveguide consists of a multi-layer having structure that three InP layers of 600nm in thickness and three InGaAsP (λ g=1.24 μm) layers of 50nm in thickness are stacked alternately and repeatedly.

13. (original) The spot size converter integrated photodetector as claimed in claim 10, wherein the second waveguide has an InGaAsP (lg=1.24 μm) layer in the range of 500nm to 600nm in thickness.